Appendix B

Artistic Plating Company
Pilot Study Report

California Environmental Protection Agency
Environmental Management System Project

1.0 Pilot Description

Artistic Plating Company (Artistic), located in Anaheim, California, is a medium-sized, metal finishing facility employing 129 individuals. The facility performs copper, nickel, brass, and chrome electroplating and specializes in electroplating zinc die-cast parts and aluminum wheels for commercial customers.

Pilot Project Management

Artistic was selected to participate as a pilot in June 2000. The Cal/EPA project manager is Jennifer Smith Grubb, a Senior Scientist at the Department of Toxic Substances Control (DTSC). The U.S. EPA project manager is Laura Bloch, an Environmental Scientist with U.S. EPA Region IX. The primary Artistic representative is Ruben Angel, the company's Health and Safety Manager.

History of the Working Relationship of U.S. EPA, Cal/EPA and Artistic

The U.S. EPA initially began working with the metal finishing industry on pollution prevention related projects. This work was conducted through U.S. EPA Region IX's Merit Partnership for Pollution Prevention (Merit). Merit is a cooperative venture of the public and private sectors whose mission is to develop and promote pollution prevention practices and technologies that both protect the environment and contribute to economic growth.

Merit identified the metal finishing industry sector because of its high Toxic Release Inventory emissions and because many businesses were concentrated in areas such as Los Angeles. In addition, this sector is composed mostly of small and medium sized enterprises (SMEs) that do not have the expertise or resources to look at more innovative approaches. The pollution prevention projects were successful, and when Merit decided to see if Environmental Management Systems (EMS) made sense for SMEs, it chose to work with the metal finishing sector once again.

Merit's approach was to first develop a user-friendly template tailored specifically for metal finishers called the Metal Finishing EMS (MFEMS) Template. Once the template was developed and given to a couple of facilities for testing, it became clear that SMEs needed assistance in implementing the template. Merit developed a workshop series to be an

efficient and cost effective method to assist a group of platers in using the template to develop EMSs for their specific facilities.

This occurred about the same time as the Cal/EPA project. U.S. EPA and Cal/EPA met and decided to work together on an EMS implementation at Artistic. Artistic Plating Company's involvement in the U.S. EPA's Merit Partnership Metal Finishing EMS (MFEMS) Template project is a critical element of the EMS Pilot Project, especially in meeting this project's specific objectives.

History of Environmental Management at Artistic Plating Company

In June 1999 Artistic Plating Company volunteered to test the EMS template developed by U.S. EPA as part of the MFEMS Template project. The MFEMS Template is based on ISO 14001, covering the essential elements of an EMS. Furthermore, it is user friendly with tools to assist in implementing the different EMS elements and is tailored to the metal finishing industry. For example, it contains a tool designed specifically for a metal finishing facility to identify its environmental aspects. The template is designed to help a company create an EMS that could serve as an initial step towards ISO 14001 certification.

In August 2000, U.S. EPA, in partnership with the Metal Finishing Association of Southern California (MFASC), sponsored a series of seven monthly workshops to assist participants in using the EMS template to develop and implement an EMS at their facilities. Nine metal finishing companies, including Artistic, completed the series. The workshops were designed to introduce different elements of the template and, through in-class exercises and discussions, homework assignments, and technical assistance between classes, to assist participants in developing and implementing an EMS. Each company developed its EMS as the workshop series progressed; and by the completion of the workshop series, each facility had a basic EMS upon which it could build and improve.

2.0 Project Objectives

The pilot project with Artistic was conducted in order to meet the following objectives specified in AB 1102 (Stats. 1999, Ch. 65) codified in Public Resources Code, Section 71045 et seq.

Objective 1 Whether and how the use of an environmental management system (EMS) by a regulated entity increases public health and environmental protection over their current regulatory requirements[1]; and

[1] Protection provided by current regulatory requirements is defined as those protections provided through the issuance, enforcement, and monitoring of any permit, requirement, authorization, standard, certification, or other approval issued by a federal, state, regional or local agency to the regulated entity for the protection of the public heath or the environment (PRC § 71046(a)(1)).

Objective 2 Whether and how the use of an EMS provides the public greater information on the nature and extent of public health and environmental effects than information provided by their current regulatory requirements[2].

To the above, the Cal/EPA added the following objectives:

Objective 3 Evaluate economic indicators to determine incentives and barriers to EMS implementation

Objective 4 Identify challenges and successful examples of EMS implementation

Further, each pilot candidate had one or more additional pilot specific objectives. The pilot specific objective for Artistic was to:

Objective 5 Evaluate the value of an EMS template, workshop series, and contractor assistance, as well as the support of an industry association, and the government's role in assisting EMS implementation with small and medium-sized enterprises.

In the following sections, each objective will be paraphrased. For example, Objective 1 is referred to as simply environmental protection. The term environmental protection is intended to capture protection of both environmental and public health.

3.0 Project Methodology

Artistic contributed data consistent with the requirements of the National Database and the California Protocols. Artistic submitted baseline data for the years 1995, 1996 and 1997. The first round of update data was submitted for the year 2000 and the second round for the first six months of 2001. Artistic, in conjunction with Cal/EPA, collected all data submitted for this report.

In addition to the protocols, participants conducted site tours of their facilities for the Cal/EPA team and Working Group members. Facilities also had consultation meetings with team members to elicit specific information about their facility.

The analysis was accomplished by evaluating changes in environmental protection and in the provision of environmental information to the public as a result of EMS implementation at the Artistic Plating Company.

[2] Information provided by current regulatory requirements is defined as that information provided through the issuance, enforcement, and monitoring of any permit, requirement, authorization, standard, certification, or other approval issued by a federal, state, regional or local agency to the regulated entity for the protection of the public heath or the environment, or any other law or regulation governing the disclosure of public information (PRC § 71046(a)(2)).

3.1 Objective 1 Environmental Protection

To determine whether and how improved environmental protection resulted from EMS implementation, the following three primary categories of information were evaluated.

1. Awareness and commitment
2. Systematic management of environmental impacts
3. Environmental performance indicators

Awareness and Commitment refers to the scope of environmental issues to which the organization devotes its attention, and identifies increased knowledge and understanding of environmental impacts, as well as recognition that action is necessary to lessen impacts and improve environmental protection.

Staff reviewed and analyzed the following measures of Awareness and Commitment:

1. The presence of an environmental policy which describes the organization's commitments and principles in regards to environmental protection.
2. Demonstrated knowledge and understanding of environmental laws, regulations, and other requirements.
3. Demonstrated knowledge and understanding of the environmental impacts of the organization.
4. Documentation of objectives and targets for environmental protection improvements.

Systematic management of environmental impacts refers to the ability of an organization to better protect the environment through a more mature and effective system of environmental management.

Staff reviewed and analyzed the following measures of systematic management for environmental protection:

1. Documented implementation strategies and responsibilities designed to meet regulatory requirements, manage significant aspects, and achieve objectives and targets for improved environmental protection.
2. Measures to assess environmental performance.
3. Audit and review processes to assess the performance of the management system and make system adjustments in order to continually improve environmental performance and protection.

Environmental performance indicators are the most quantitative and direct way of measuring changes in environmental protection. Key environmental indicators are the direct performance measure of an EMS. Examples include energy use, water use, solid and hazardous waste reduction, air emission, and quality of water discharge. An analysis of key environmental indicators provides information as to whether an EMS improves environmental protection.

Project staff reviewed and analyzed environmental data in the following areas to determine whether the EMS improved environmental protection.

1. Progress towards objectives and targets,
2. Pre and Post EMS Environmental Performance
3. Performance Beyond Regulatory Requirements
4. Compliance Performance

3.2 Objective 2 Environmental Information

Staff analyzed the following two factors to determine whether and how an EMS provides greater environmental information to the public was accomplished.

1. The level of public and stakeholder involvement in the EMS development, implementation, and review; and
2. The level of improvements in the accessibility and quality of environmental information available to the public as a result of EMS implementation.

The level of public and stakeholder involvement in EMS development, implementation and review not only indicates changes in communication, it also indicates a changing stakeholder role in improving environmental protection. Involvement provides avenues for stakeholder response to environmental information and feedback to the organization on their performance. This indicator of greater environmental information is measured by evaluating actual stakeholder participation in the pilot's EMS and processes in the EMS for outside communication. This information was collected through the National Database, California Protocol and through Cal/EPA Project Manager's observations.

Improvements in the accessibility and quality of environmental information were evaluated using the California Protocols. Improvements in compliance with legal reporting requirements and information sharing beyond legal requirements indicate improved communication to the public. Accessibility and quality (timeliness, relevance, completeness, and credibility) is evaluated to determine whether the EMS results in greater information available to the public.

3.3 Objective 3 Economic Indicators

Economic indicators provide an indication of economic costs and benefits of EMS implementation. Although determining economic impacts of EMS implementation is not a primary objective of the EMS Pilot Project, understanding these impacts is helpful in identifying incentives and barriers to EMS implementation. The economic data is analyzed to determine if the EMS provided savings incentives or increases in the costs of environmental management.

3.4 Objective 4 Successes and Challenges of EMS Implementation

Each pilot project offers unique experiences that provide lessons on the challenges inherent in the successful implementation of an EMS. These lessons help develop an understanding of the necessary or critical elements for successful EMS implementation. Challenges and successes were identified through the Cal/EPA and U.S. EPA Project Managers' observations, interviews with Artistic Plating Company personnel and data analysis.

3.5 Objective 5 Evaluate the value of an EMS template, workshop series, and contractor assistance, as well as the support of an industry association, and the government's role for assisting EMS implementation with small and medium-sized enterprises.

Value was determined by Cal/EPA and U.S. EPA Project Managers' observations, interviews with Artistic Plating Company personnel and data analysis.

4.0 Discussion and Analysis

4.1 Objective 1 Environmental Protection

Awareness and Commitment

Environmental Policy

Awareness and Commitment are developed during the planning phase of the EMS. Artistic Plating Company has a comprehensive statement of Environmental Policy (EP). In the EP, Artistic commits to full compliance with all health, safety and environmental regulations, using the best management practices and best available control technologies for the prevention of pollution and reduction of waste from production operations and to involving its employees in the EMS, through training and enhancing their awareness and role in safety and environmental issues.

To maximize the effectiveness of its EMS, Artistic places responsibility for policy implementation on all its employees, and commits to providing its employees with the training necessary to enhance "their awareness and role they play in safety and environmental issues at work and in society." Management commitment to increasing awareness is demonstrated by the company president's signature directly on the policy statement.

Knowledge and Understanding of Legal Requirements

Artistic gets information on applicable environmental, and health and safety requirements through its industry association, the Metal Finishing Association of Southern California (MFASC), the American Society of Safety Engineers, as well as from the regulatory agencies, consultants and professional publications. Regulatory topics and compliance issues are addressed in monthly MFASC newsletters, education seminars and association

meetings. This includes information regarding ongoing legal requirements as well as upcoming regulations.

The EMS template used by Artistic included procedures and tools tailored to assist a metal finishing operation identify, understand and develop tools to assist the facility in meeting regulatory requirements. These tools are described below.

- The *Environmental and Health & Safety Regulatory Compliance Checklist (Checklist)* contains an extensive, but not comprehensive, overview of a wide range of applicable federal, state, and local regulations that metal finishers in southern California commonly encounter. The Checklist is designed as an "office exercise" to identify any apparent weaknesses in a facility's current compliance approach and status. Companies are directed to gather a team of employees who have first-hand knowledge of the questions posed in the Checklist and to answer the questions honestly and precisely to create an accurate assessment of the company's compliance performance. References are provided for each question in the checklist and include the governing regulation, guidance documents, and other helpful resources.
- The *Compliance Calendar* provides a summary of the Checklist organized around the frequency of completing and reporting requirements. With cross-references that point to relevant sections of the Checklist, the compliance calendar summarizes deadlines for requirements that must be completed daily, weekly, monthly, annually, or on a specific date.
- The *Regulatory Agency Diagram* is a one page summary of the regulatory framework that surrounds metal finishers in southern California. The diagram is a simplified representation of the various federal, state, and local regulatory agencies and the associated compliance areas.

<u>Knowledge and Understanding of Environmental Impacts</u>

A critical element of the EMS development process involves identifying and prioritizing the environmental aspects and impacts associated with a facility. The process of identifying environmental aspects and impacts is important because high-priority environmental aspects and impacts are considered when environmental objectives and targets are established.

An environmental aspect is an element of an organization's activities, products, or services that can interact with the environment. Chrome plating is a metal finishing activity and an associated aspect is chrome air emissions. This aspect may have an impact on the environment in several ways, for example, ambient air quality degradation.

Significant aspects and impacts are determined by the organization based on self-established standard methodology. Management of all significant aspects is required by ISO 14001. Significant aspects are therefore a good indicator of awareness and

commitment. Table 1 lists all significant aspects and impacts for Artistic Plating Company and whether the aspect relates to regulated or non-regulated impacts.

Artistic used detailed matrices to list and then prioritize environmental aspects and impacts specific to their operations according to the following categories:

- Wastewater
- Air emissions
- Hazardous and solid waste
- Raw materials
- Water and energy

Table 1 documents significant aspects and impacts and whether the aspect relates to a regulated or non-regulated impact. Artistic identified the following as high priority environmental aspects and impacts.

- Chromium-containing wastewater from chrome plating
- Cyanide-containing wastewater from cyanide plating
- Nitric acid from stripping operations
- Process water use
- Wastewater treatment sludge generated[3]
- Perchloroethylene vapors from degreasing operations

Every aspect except water usage has one or more regulated impacts. For example, chromium and cyanide (regulated aspects) impact water; nitric acid and perchloroethylene (also regulated) impact air; and wastewater treatment sludge (regulated) impacts hazardous waste generated.

Implementation of an EMS has helped Artistic better understand its environmental impacts through the aspect/impact identification process. Through the prioritization process, Artistic identified the operation's impacts on the environment, determined which impacts were most significant and established priorities for reducing impacts. These priorities were used to develop the objectives and targets listed in Table 2.

Objectives and Targets

Table 2 lists objectives and targets for Artistic, as well as the current status and whether the objective meets or surpasses regulatory requirements, or if the objective addresses non-regulated impacts.

An analysis of Artistic's objectives and targets illustrates the company's commitment to exceed regulatory performance requirements for chromium, cyanide, perchloroethylene,

[3] Wastewater treatment system (WWTS) sludge is related to water use. The amount of water used is directly related to the amount of wastewater treated, and the amount of wastewater treated is directly related to the amount of sludge generated.

and nitric acid. Artistic has committed to reduce chromium and cyanide use to levels 50 percent below their allowable permitted levels, to entirely eliminate the use of perchloroethylene ahead of the scheduled regulatory phase out, and to reduce nitric acid use by 95 percent.

Process water use is indirectly regulated through permitted limits on the amount of wastewater discharged to the sewer. Artistic set a target to reduce process water to meet the permit wastewater discharge requirement of 20,000 gallons per day. A reduction in water use would not only conserve water but also reduce wastewater to the Orange County Sanitation District treatment plant.

In summary, all of the top objectives and targets have quantitative goals, and two surpass regulatory requirements, and one meets a future South Coast Air Quality Management District (AQMD) requirement to eliminate the use of perchloroethylene under the Solvent Rule.

Systematic Management for Environmental Protection

This section describes the actions taken by the organization that relate to the implementation and review phases of the EMS and document how the organization protects the environment through its operations. Artistic has implemented various system design elements to provide Systematic Management for Environmental Protection.

Documented Implementation Strategies and Responsibilities

Artistic's Documented Implementation Strategies and Responsibilities include the following.

- Operational Controls
- Training Programs
- Emergency Preparedness
- Compliance Assurance
- Employee Involvement and Communication
- Pollution Prevention Programs
- Health and Safety
- Performance Tracking
- Audit and Review

Operational Controls

Operational controls pre- and post- EMS have not changed significantly. Designated personnel are trained to add and remove chemicals to metal finishing solutions, based on production criteria. Regular chemical lab analyses are conducted and results are kept as well. The Health and Safety Manager conducts daily inspections of the hazardous materials areas.

Training Programs

Training programs include:

- Integrated health and safety and emergency response
- Hazardous waste management
- Hazardous energy control (procedures for shutting down operations)
- First aid and cardiopulmonary resuscitation (CPR)
- Hazard Communication/Proposition 65
- Injury and illness prevention
- Contingency plan, fire prevention and emergency action
- Respiratory training
- Dragout reduction techniques (reduction of chemical loss from plating tanks)

With the exception of the dragout reduction training, all of these trainings are otherwise required. Dragout reduction training was added as a direct result of EMS implementation.

Emergency Preparedness

Emergency preparedness procedures were in place prior to EMS implementation and are now incorporated into Artistic's EMS. A health and safety and emergency preparedness plan is on file with the City of Anaheim Fire Department. Selected personnel are trained to respond to emergencies such as hazardous spills and fires. Prevention is emphasized. Lead personnel are trained in first aid and CPR. Five emergency coordinators have been established with specific responsibilities. Employees have been trained to implement evacuation procedures, including the use of proper personal protective equipment, and the removal of incompatible materials.

Compliance Assurance

As a result of EMS implementation, Artistic chose to monitor wastewater discharges on a monthly basis rather than quarterly as required by the Orange County Sanitation District. This more frequent monitoring allows them to better control a significant aspect, track progress towards objectives, and identify and correct problems. For air monitoring, Artistic conducts baseline source tests and then follows the Southern California Air Quality Management District permit requirements for equipment checks and emissions monitoring. Regarding hazardous waste, every shipment of nitric acid is sampled. Spent nitric strippers are characterized at a hazardous waste lab and the concentration of metals is determined. Polish buff dust is recycled. Storm water runoff is sampled and reported to the regional water board.

The *Environmental and Health & Safety Regulatory Compliance Checklist (Checklist)* and the *Compliance Calendar* discussed earlier in this report contains useful information regarding governing regulations, guidance documents, and other helpful resources and summarizes deadlines for requirements that must be completed daily, weekly, monthly, annually, or on a specific date.

Employee Involvement and Communication

Artistic established “environmental teams” comprised of supervisors and employees that meet and discuss EMS results and roles and responsibilities for pollution prevention and compliance assurance. An EMS bulletin board was set up next to the employee time clock that includes the policy statement (in Spanish and English), objectives and targets, and EMS graphs and charts which provide a visual display of the facility’s progress towards meeting objectives and targets.

Pollution Prevention Programs

A significant pollution prevention change made by Artistic Plating Company through its EMS was the elimination of perchloroethylene and replacement with an ultrasonic aqueous immersion cleaning tank for parts cleaning.

Artistic has reduced total chromium discharge through several source reduction actions. Specifically, a new drip board was installed to reduce dragout (loss of chemicals from a plating tank), workers received dragout reduction training, and anodes were repositioned to achieve comparable plating at a lower chromium concentration.

The cyanide discharge concentration was reduced through source reduction actions, improved treatment and waste treatment. A third-stage cyanide treatment unit was added, workers received dragout reduction training, and the pH of the cyanide baths was lowered which improved cyanide treatment. Moreover, increased analytical monitoring was implemented on a bi-weekly basis to fine-tune the cyanide reduction pretreatment process. Finally, a cyanide-based nickel strip was eliminated from cyanide plating operations allowing for a reduction in the amount of liquid chlorine usage.

Health and Safety

Artistic's EMS includes a component addressing environmental health and safety. Artistic is promoting a philosophy that environmental and safety performance is inherent in each person’s job and, as such, has incorporated EMS responsibilities into job descriptions and into the employee’s annual review. Artistic’s approach is to build a culture of awareness and responsibility around environmental and safety related issues that prompts a response to compliance and aims at exceeding compliance.

Performance Tracking

The Artistic EMS provides a mechanism to track performance and progress towards objectives. Metrics measured include amp hours, production levels, water use rate, chemical use rate, gas usage, energy usage, wastewater discharge quality, and the reject and rework rate. Measurements are taken daily or monthly, depending on the metric. Personnel involved in metric measurement are the Health and Safety Manager, wastewater treatment operators and the assistant regulatory compliance operator.

Audit and Review

The Artistic EMS requires the Health and Safety Manager review the environmental performance data, including environmental performance measures and post this data monthly on the EMS Bulletin Board. Changes in performance are investigated and documented and instances of noncompliance with procedures by personnel are documented in their personnel file. Corrective action procedures include evaluation and documentation of the hazard; identification of the root cause; and resolution of the problem in a timely manner. Artistic plans to conduct a complete system audit this year.

Environmental Performance Indicators

The actual environmental performance of the pilot during the study period is described below.

Progress towards Objectives and Targets, Table 2

Artistic identified EMS objectives and targets that went beyond minimum regulatory requirements for chromium, cyanide, nitric acid and ahead of an upcoming regulatory requirement for perchloroethylene. The objective and target relating to the amount of generated wastewater treatment sludge is not limited by regulation. Process water use is indirectly regulated through permitted limits on the amount of wastewater discharged to the sewer. Artistic, after meeting its initial goal, increased water usage when production expanded. A variance was granted for wastewater discharged.

Specifically, Artistic has reduced total chromium discharge (chromium concentration at influent to wastewater treatment system) to a level 50% lower than the permitted limit through several source reduction actions. A new drip board was installed to reduce dragout (loss of chemicals from a plating tank), workers received dragout reduction training, and anodes were repositioned to achieve comparable plating at a lower chromium concentration.

The target to reduce Artistic's cyanide discharge concentration to a level 50% lower than the permitted limit was achieved through source reduction actions, improved treatment and waste treatment. A third-stage cyanide treatment unit was added, workers received dragout reduction training, and the pH of the cyanide baths was lowered which improved cyanide treatment. Moreover, increased analytical monitoring was implemented on a bi-weekly basis to fine-tune the cyanide reduction pretreatment process. Finally, a cyanide-based nickel strip was eliminated from cyanide plating operations allowing for a 50% reduction in the amount of liquid chlorine usage.

The target to reduce nitric acid use by 95% is in process. Material substitution alternatives are under investigation and presently being tested. To date, alternative materials have not yielded acceptable quality levels. Communication with chemical supply companies is ongoing in the search for more environmentally benign chemicals.

Regarding water use, the facility achieved its initial objective and target of meeting the permit requirement of 20,000 gallons per day. Following that achievement, Artistic added

an additional hoist line to its plating process. This process expansion occurred in August 2000. This new line uses approximately 14,000 gallons of water per day. Artistic was granted a variance to discharge 30,000 to 32,000 gallons per day, up from the 20,000 gallons per day previously permitted. Artistic would like to increase its water use efficiency and plans to set a new objective and target related to water use and wastewater discharge when it revisits its objectives and targets as part of its first internal EMS audit this year.

A significant change by Artistic Plating Company was the elimination of perchloroethylene and replacement with an ultrasonic aqueous immersion cleaning tank for parts cleaning. This yielded a decreased public exposure risk, decreased risk to workers, decreased worker compensation insurance premiums, decreased medical and biological monitoring, decreased lab analysis and disposal costs, decreased air sampling costs, and decreased air quality district emission fees.

Other objectives and targets include:

- Preparing a closure plan
- Conducting a quarterly safety committee meetings
- Updating the status of tiered permitting
- Preparing the California Accidental Release Prevention Program documents (CalARP)
- Establishing alternate contract with emergency services firm
- Tracking and/or recording hazardous waste treated via daily, weekly and monthly inspections
- Conducting daily surface tension measurements for chrome tanks
- Complying with confined spaces regulations by putting a program in place.

These additional objectives and targets have been met, with the exception of the frequency of safety committee meetings and the approval of the CalARP document. Safety committee meetings are currently held twice a year, rather than quarterly, as identified in the target. The CalARP document has been prepared and submitted, but notification of approval has not yet been received from Anaheim Fire Department.

Pre and Post EMS Environmental Performance, Table 3

Table 3 lists environmental performance indicators for the baseline years (1995-1997) and update data for 2000 and the first half of 2001. The table reports performance for wastewater volume, copper in wastewater, heavy metals sludge, perchloroethylene, and spent nitric acid.

In 1999, when Artistic set its initial targets and objectives, it established a target of reducing process water use to meet permit requirements of 20,000 gallons of wastewater discharged per day. Process water use is indirectly regulated through permitted limits on the amount of wastewater discharged to the sewer. Wastewater volume increased in 1999 because a new wheel line requiring more water had been added to Artistic's production process. Conductivity sensors were then added to all rinsing tanks. With the installation of this new

equipment, Artistic realized a 72% decrease in wastewater produced in the wheel line, from 12,960 gallons to 4,000 gallons per day

Because production doubled in 2001, total water usage (and thereby wastewater generated) increased, but only by approximately one-third (from 22,000 gpd to 29,128 gpd). Data was normalized to reflect growth in employees because of increased production. (Baseline year measurements of 606 gallons per day per employee, 333 gallons per day per employee and 273 gallons per day per employee were reported for years 1995, 1996 and 1997, respectively. During the first update period for year 2000, normalized wastewater usage was 198 gallons per day per employee, reflecting a downward trend. In the first six months of 2001, it increased to 277 gpd per employee, close to the lowest of the three baseline year measurements. This increase was due to the doubling of production.

Overall, copper discharges to the sewage treatment plant were reduced. In the baseline years (1995-1997), copper measured 0.012, 0.019 and 0.025 milligrams per liter (mg/l) per employee. In 2000, copper discharges were 0.003 mg/l and in the first six months of 2001, copper discharges were 0.007 mg/l. Several things were done to facilitate these reductions. First, the wastewater treatment process was monitored more closely; second, the pre-treatment process was evaluated and readjusted; and third, the wastewater discharge was monitored using spectrophotometry equipment twice daily. Efforts to reduce process water use through source reduction and in-process recycling are ongoing.

Sludge volume for the three baseline years (1995-1997) measured 511, 705 and 750 pounds per quarter per employee, when normalized. During the first update period (year 2000), sludge volume increased to 811 pounds per quarter per employee, when normalized. This increase was due to the addition of a new hoist line, which used more water, and consequently, generated more sludge. During the second update period (first six months of 2001), sludge volume decreased to 455 pounds per quarter per employee, normalized.

In 2001, the installation of flow restrictors in the hoist line reduced water usage, and therefore sludge generation. Artistic has reduced sludge volume indirectly by the installation of conductivity sensors in the rinsing tanks. Techniques to reduce dragout have been put into practice and enforced more strictly. In addition, the overall operation of wastewater processes is monitored more consistently. Moreover, two additional wastewater treatment operators were added to this operation.

Spent perchloroethylene usage was eliminated in the year 2000. Baseline years (1995-1997) measured 6.12, 6.49 and 14.97gallons per quarter per employee. In 2000, usage decreased to 3.19 gallons per quarter per employee, until it was eliminated.

Spent nitric acid during the baseline years (1995-1997) measured 77.9 and 63.5 pounds per employee, normalized. No data was available for 1996, the middle of the three baseline years. During 2000, spent nitric acid measured 50.8 pounds per employee when normalized, and in the first six months of 2001, spent nitric acid measured 67.8 pounds per employee when normalized. Material substitution alternatives are under investigation.

Communication with chemical supply companies is ongoing in the search for more environmentally benign chemicals. Artistic has not yet made significant progress on its goal of 95% reduction in nitric acid use, in part because viable alternatives have not been available in the industry.

Other environmental performance measures were tracked only during the update period, including surface tension in the chrome bath, power usage and gas usage. Surface tension in the chrome bath has a direct impact on air quality, therefore Artistic is tracking this measurement daily, rather than weekly as the regulations require. The regulatory requirement for surface tension in the chrome bath is 45 dynes/cm squared. Artistic is below this requirement at 33 dynes/cm squared in 2000 and 29 dynes/cm squared in the first six months of 2001.

In summary, a comparison of pre and post EMS environmental performance shows decreases for copper in wastewater, heavy metals sludge volume, and perchloroethylene. Overall wastewater discharge levels were greater in 2000 and 2001 than 1997, the third baseline year. Although production doubled in 2001, wastewater discharge increased by only one-third, reflecting water conservation practices. The change in nitric acid has not been significant. For indicators with identified objectives, performance has improved, except for nitric acid. Indicators without objectives, such as buffing dust, also decreased after normalization.

Performance beyond Regulatory Requirements, Table 4

Table 4 shows how the facility performs against their permitted emissions.

Artistic's goal is to maintain compliance, and reduce emissions beyond compliance levels wherever possible. Artistic has air permits from the South Coast Air Quality Management District. Artistic has wastewater discharge permits from the Orange County Sanitation District.

Air regulations are complex in that they require more than simple permit limits. Certain permit limits depend on when the company entered the permitting system. Artistic came into the permitting process in 1993, therefore its permit limits are less stringent than those for new sources. Other air regulations impose operating conditions that are retroactive and these conditions prevent the process that is permitted from emitting to the permitted limit. For example, one operating condition is that the surface tension in the chrome bath must be below 45 dynes per cm squared. By operating under this condition, Artistic is limited in the amount of chrome it can emit. Artistic is well within its permitted limits for air emissions.

Artistic's wastewater permit sets limits on the amount of process water used as well as chemical concentrations in wastewater. These two parameters allow the sanitation district to calculate mass discharges from the facility. The water regulations set concentration-based limits. Artistic operates well within its permitted limits. Artistic regularly operates within its permit condition for process water use, and regularly maintains concentrations that are lower than the concentrations allowed in their permits. For example, the total

chromium limit from the OCSD permit is 2.00 mg/L, and in 2000 and 2001 Artistic had average chrome concentrations of 0.81 and 0.37 mg/L respectively. However, as the next section will describe, Artistic still has some compliance challenges.

Compliance Performance, Table 5

Table 5 provides compliance information during the baseline and update periods. Before EMS implementation, during the baseline period for data collection in 1996, Artistic had 4 major violations totaling $2,089 in fines (fees for laboratory testing); 3 minor violations totaling $244 in fines (fees for laboratory testing); and one non-compliance. In 1997, Artistic was cited for one minor violation and was fined $244 for laboratory testing fees.

During 2000, after EMS implementation, Artistic had no violation citations or incidents of non-compliance. In 2001, however, Artistic had 3 major violations with a $535 fine (laboratory testing fee) for each violation, totaling $1,605. These three violations were related to chromium, nickel and cyanide discharge exceedances.

The chromium violation was due to a malfunction in the monitoring equipment (oxygen reduction potential control unit), which was repaired upon discovery. The nickel violation happened as a result of this incident, because the incorrect quantity of pH adjusting chemicals was then added. Artistic added a second feeding pump to increase the amount of chemical added in the chromium reduction process. A second chromium violation was related to an exceedence of the permitted discharge limit of water. This resulted in a permitted mass emission rate flow violation. Artistic's permitted mass emission rate flow of wastewater discharge was 20,000 gallons per day. Artistic discharged 37,000 gallons on the day of violation. Artistic now has a variance from Orange County Sanitation District to discharge from 30,000 to 32,000 gallons per day. Corrective measures included the hiring of a wastewater treatment operator. New chromium plating parameters were set to maintain concentrations at a lower level. Also, flow restrictors were installed in the hoist line.

Artistic self-reported the cyanide violation to Orange County Sanitation District. The violation occurred because the pump line that supplied magnesium oxide became clogged, and consequently the cyanide discharge level was exceeded. Magnesium oxide is used to precipitate out the cyanide chelators. Sampling was instituted on a weekly basis for the following month to determine whether the problem was completely corrected.

Before EMS implementation, Artistic was having wastewater compliance problems. As a result of the EMS, Artistic is now monitoring wastewater once per month instead of the required quarterly monitoring schedule. This increased monitoring schedule has helped Artistic become more proactive in identifying potential releases or compliance deficiencies before they occur. Because of the data Artistic collects as part of the EMS, they are now able to respond more quickly to slight variances and implement corrective measures more rapidly, as well as evaluate the reasons for the occurrence. Furthermore, employees are now notified of violations (self discovered or by regulatory agency) through posting on the EMS bulletin board.

4.2 Objective 2 Environmental Information

Public and Stakeholder Involvement in EMS Development, Implementation and Review

Cal/EPA established stakeholder Working Groups in both Southern and Northern California. Participation in one of those Working Groups was a requirement of inclusion into the pilot project. Working Groups were established to enlist stakeholder involvement and advice in meeting the objectives of the Cal/EPA pilot project as well as to provide a forum for stakeholder input into the pilot's EMS. Although pilot project participation with stakeholders through the Working Group was a project requirement, the experience of Artistic Plating Company in this setting can provide information as to the willingness of parties to work together as well as the value of that relationship. Artistic Plating Company participated on the Southern California Working Group and hosted an on-site meeting and facility tour in September, 2000. During this meeting, Artistic shared its identified significant impacts and shared progress towards meeting objectives set forth in their EMS. Participants asked questions and provided input informally.

Through the Merit Partnership, Artistic included U.S. EPA in the development of its EMS. The public was not involved in Artistic's EMS. This direct government involvement strongly influenced the quality of the EMS by helping identify environmental impacts and establish performance objectives that were consistent with U.S EPA's goals for the Merit Partnership and the Strategic Goals Program.

Artistic's involvement with stakeholders demonstrates a willingness to engage with and involve outside parties in their EMS implementation and process of continual improvement.

Improvements in Accessibility and Quality of Information

Table 6 identifies environmental information type and availability to the public. This information is analyzed to determine whether greater environmental information is available to the public than that which is required by law and regulation.

All EMS related information from Artistic is available to the public upon request. This includes the EMS policy, environmental aspects and impacts, objectives and targets, operation and procedures, resource use data, and solid waste data. In addition, information which is legally required to be shared with regulatory agencies, including compliance information, hazardous waste generation information, air emissions, water discharge information, Toxic Release Inventory, Community Right to Know, Proposition 65, and Source Reduction Act Report (SB 14) reports is available.

As part of the Cal/EPA EMS Pilot Project, Artistic provided EMS information to the Southern California Working Group, including aspects and impacts, objectives and targets, environmental performance, compliance, and costs and savings. Artistic also shared

information through Cal/EPA's quarterly reports and Cal/EPA's interim final report to the legislature. These reports are available through Cal/EPA's website. Thus, access to EMS information did improve.

Although there was no broad distribution of EMS information to the public by Artistic, EMS information was openly shared with the Working Group, which is composed of non-governmental organizations, business and government. Prior to EMS implementation, no process existed for sharing information with stakeholders. As a result of EMS implementation, Artistic generated a greater amount of environmental information on their impacts and activities than was available prior to the EMS. The EMS also helped Artistic organize the information so that it would be usable internally as well as for external stakeholders like government or the community.

4.3 Objective 3 Economic Incentives and Barriers to EMS Implementation

The costs and benefits realized from managing perchloroethylene, total chromium, cyanide, liquid chlorine, nitric acid, copper, and sludge are from estimates by Artistic Plating Company. The elimination of perchloroethylene cost $130,000 in initial implementation and will save in the range of $9,500 to $10,500 per year in decreased air sampling costs, decreased medical and biological monitoring, savings in testing and lab analysis, decreased disposal costs, and reduced air quality factor emission fees. In addition, Artistic's insurance company intends to reduce workers compensation insurance premiums.

Wastewater discharges to the local treatment plant were reduced through increased water testing and lab analysis at a cost of $2,000 per year for total chromium, $4,500 per year for cyanide, and $2,000 per year for copper. A third stage tank with mixer and controls was added at a cost of $10,000. These actions have helped Artistic stay within permitted limits. Liquid chlorine usage was reduced, yielding $42,000 per year in savings. A reduction in other wastewater treatment materials saved $6,000 per year.

Nitric acid cost savings of $360 per day were realized through the reduction of plating rejects. Costs from nitric acid use in the year 2000 came from treatment of spent triacid (70% nitric acid) totaling $1,050 per week in additional costs, as well as $450 in added caustic soda costs per week. In 2001, nitric acid costs have been reduced by $750 per week through the testing of various substitutes.

Decreased sludge volume led to savings of $18,896 per year in disposal costs, and $2,500 savings in reduced quantity of testing and lab analysis required. These savings justified the hiring of an additional treatment operator in April 2001 at $26,000 per year.

As indicated by the data, there is a positive trend in cost savings as a result of EMS implementation. Costs and savings projected over a 10 year period result in Artistic realizing $1,028,960[4] in savings, after deducting one time costs (see Table 7).

[4] Costs and benefit data were provided by Artistic staff.

4.4 Objective 4 Successes and Challenges of EMS Implementation

A key to EMS implementation at Artistic is the on-site presence of the Health and Safety Manager, Ruben Angel, who is personally committed to successful EMS implementation at Artistic. His leadership led to the replacement of perchloroethylene with an aqueous based cleaner. He is currently searching for other environmentally friendly chemical substitutes for various processes at Artistic. Management has provided financial support to these efforts, which has been critical to successful EMS implementation.

Maintaining focus to assure continual improvement is a challenge for a small and medium sized enterprise or SME such as Artistic. This was particularly true during the early implementation phase. Specifically, the facility's EMS champion has diverse responsibilities, and global environmental and health and safety responsibilities had not been distributed to other personnel. Artistic has recognized this difficulty, and is now distributing more EMS responsibilities to other employees, as well as reassigning some of the production and personnel related duties which the Health and Safety Manager had been given.

Artistic has developed and implemented its EMS and is now in the process of integrating it into how the company conducts business. Artistic has difficulty balancing EMS work among other priorities beyond environmental health and safety, such as human resources personnel actions, and production demands. They expect this problem to decrease as its EMS is integrated into the everyday running of the business.

4.5 Objective 5 The value of Government Assistance to Small and Medium Sized Enterprises Attempting EMS Implementation

Artistic representatives state that utilization of an industry-specific EMS template was helpful in developing the EMS, providing suggested aspects and impacts, compliance checklists and much needed organization and structure.

Participation in an industry-specific EMS workshop series with eight other metal finishing companies helped Artistic through group learning and building on each others' ideas, as each company developed its own EMS and shared their insights. Onsite contractor assistance from the workshop instructors helped Artistic with EMS implementation of objectives and targets, and fleshing out EMS documentation details. Working with an industry association was important from the standpoint of sharing information with other metal finishers through an established forum. Demonstration of a joint U.S. EPA and Cal/EPA project was important in order to build on the work already done by U.S. EPA with Artistic and the metal finishing industry, as well as illustrate the advantages of government working together to help industry improve environmental performance and communication.

Anecdotal evidence suggests the interactive workshop series, which included contractor site visits between workshops to assist with implementation, was instrumental in helping the participants implement EMSs that are successfully helping them manage their

environmental obligations. The U.S. EPA is currently evaluating the success of the Southern California EMS Workshop Series, one year after its conclusion.

.

The support of an industry association is an important partnership in promoting EMSs to SMEs in an industry sector. The Metal Finishing Association of Southern California (MFASC) industry association was instrumental in building interest in EMS implementation, adding credibility to the workshop series and promoting it (e.g., through newsletters, special mailings, and association meetings) to potential participants.

In conclusion, the company reported that a user-friendly and industry-specific EMS template that emphasizes compliance, pollution prevention, and stakeholder involvement helped this small to medium-sized enterprise implement an EMS.

5.0 Findings

All of the environmental aspects of the metal plating operations at Artistic were identified as significant in the EMS process. As a result, performance objectives and targets were set, a management system was established, and enhanced performance in targeted areas was achieved. Several of the performance enhancements went beyond legal requirements.

5.1 Objective 1 Environmental Protection

- Artistic's commitment to environmental protection is clearly articulated in their environmental policy. Artistic commits to 1) full compliance with all health and safety and environmental regulations; 2) using the best management practices and best available control technologies for the prevention of pollution and reduction of waste from production operations; and 3) actively involving its employees in the EMS, through training and enhancing their awareness and role in safety and environmental issues. No environmental policy or other expression of environmental commitments existed prior to EMS implementation.
- Artistic staff has gained a more comprehensive knowledge and understanding of its legal requirements through EMS implementation. In addition, Artistic has increased the use of professional consultative services in preparing and reviewing reports required by regulatory agencies.
- Through EMS implementation, Artistic Plating Company's staff has an increased awareness and understanding of their environmental impacts increased. The EMS provided a process to identify impacts and rank their significance, thereby allowing Artistic Plating Company to set priorities for action. This type of process was not present prior to EMS implementation.
- Artistic representatives state that the Metal Finishing EMS Template helped them simplify the difficult and time consuming task of identifying, prioritizing and documenting environmental aspects and impacts.
- Increased awareness and understanding of environmental impacts led the Artistic staff to include specific EMS objectives and key performance achievements that

resulted in reduced impacts on the environment in several instances, thus improving environmental protection.

- Basic operational controls pre- and post- EMS have not changed significantly. Operational control improvements relating to the EMS focus on pollution prevention.
- As a result of pollution prevention objectives in Artistic's EMS, dragout reduction training has been conducted to reduce the loss of chemicals from plating tanks. This training resulted in a reduction in total chromium discharge concentration and cyanide discharge concentration.
- Emergency procedures are required by regulation and were in place prior to EMS implementation. The EMS had little or no effect on emergency procedures.
- As a result of EMS implementation, Artistic monitors wastewater discharges more frequently than legally required. For other requirements, such as those for air monitoring, hazardous waste, and storm water runoff, Artistic follows regulatory requirements for testing, sampling and reporting.
- As a result of the EMS, internal communication on environmental, health and safety has improved in two ways.
    - Supervisors conduct safety committee meetings and quality control meetings with employees on a regular basis and discuss EMS results. Roles and responsibilities for pollution prevention and compliance assurance are assigned to key personnel.
    - EMS bulletin board was set up, including the policy statement (in Spanish and English), objectives and targets, and EMS graphs and charts which provide a visual display of the facility's progress towards meeting objectives and targets.
- Through EMS implementation, Artistic has institutionalized the concept that environmental and safety performance is inherent in each employee's job. Artistic's approach is to build a culture of awareness and responsibility around environmental and safety related issues that prompts a response to compliance and aims at exceeding compliance. An important ingredient is management support for EMS goals. Artistic reinforces this by incorporating EMS responsibilities into job descriptions and evaluating employees on their progress annually.
- As a result of EMS implementation, Artistic developed metrics to track performance and progress towards objectives.
- Because of EMS implementation, the Health and Safety Manager reviews the environmental performance data, including environmental performance measures. Progress is posted monthly on the EMS Bulletin Board.
- Artistic has not yet conducted a comprehensive EMS audit. Artistic plans to conduct a complete system audit this year.
- Perchloroethylene was eliminated in the year 2000 and replaced with an ultrasonic aqueous immersion cleaning tank for parts cleaning. This yielded a decreased public exposure risk, decreased risk to workers, decreased worker compensation

insurance premiums, decreased medical and biological monitoring, decreased lab analysis and disposal costs, decreased air sampling costs, and decreased air quality district emission fees.

- Artistic has reduced total chromium discharge (chromium concentration at influent to wastewater treatment system) to a level 50% lower than the permitted limit through several source reduction actions.
- The target to reduce Artistic's cyanide discharge concentration to a level 50% lower than the permitted limit was achieved through source reduction actions, improved treatment, waste treatment and employee training.
- Liquid chlorine usage was reduced 50% by eliminating a cyanide-based nickel strip from cyanide plating operations.
- The target to reduce nitric acid use by 95% has not been met. To date, alternative materials have not yielded acceptable quality levels. Communication with chemical supply companies is ongoing in the search for more environmentally benign chemicals. Artistic has not yet made significant progress on its goal of 95% reduction in nitric acid use, in part because viable alternatives have not been available in the industry.
- Artistic achieved its initial objective and target for water use reduction; however water usage increased by one third when production doubled. Artistic requested and was granted a variance for the increased water usage. They intend to set a new objective and target to increase water use efficiency. If wastewater discharge is normalized using production, and not employees, wastewater discharge declined.
- All additional objectives and targets have been met, with the exception of the frequency of safety committee meetings and approval of the CalARP document. Safety committee meetings are currently held twice a year, rather than quarterly. The Cal/ARP document is awaiting local regulatory approval.
- Overall, copper discharges to the sewage treatment plant were reduced and sludge volume has decreased.
- Although Artistic received some violations during the study period, the EMS has helped Artistic with compliance issues. Increased monitoring schedules resulting from EMS implementation helped the company anticipate potential releases or compliance deficiencies, reduce response time and delay in implementing corrective measures, as well as evaluate the underlying causes of deficiencies.
- Some compliance issues observed at Artistic are in part attributed to production pressures and a lack of adequate operational controls. Operational controls were not included in the Metal Finishing EMS Template used by Artistic in creating their EMS. Operational controls appear an important part of a fully implemented and integrated system. Also, system audits have not yet been conducted at Artistic.

5.2 Objective 2 Environmental Information

- Artistic's EMS generated a great deal of environmental information that was not available prior to EMS implementation. These include an environmental policy, a list of significant impacts, objectives and targets, and performance indicators.
- All EMS related information from Artistic is available to the public upon request.
- Although there was no broad distribution of EMS information to the public by Artistic, EMS information was openly shared with the Working Group, which is composed of non-governmental organizations, business and government.
- Through the Merit Partnership, Artistic included U.S. EPA in the development of its EMS. The public was not involved in Artistic's EMS. This direct government involvement strongly influenced the quality of the EMS by helping identify environmental impacts and establish performance objectives that were consistent with U.S. EPA's goals.

5.3 Objective 3 Economic Incentives and Barriers to EMS Implementation

- There is a positive trend in cost savings as a result of EMS implementation. When costs and savings are projected over a 10 year period, Artistic will realize $1,028,960 in savings, after deducting one time costs (see Table 7). Overall, the primary costs and benefits were realized from managing perchloroethylene, total chromium, cyanide, liquid chlorine, nitric acid, copper, and sludge. Initial implementation costs for replacement of perchloroethylene with an aqueous based cleaner were significant, but will be recovered over the next several years.
- Economic costs were taken into consideration when implementing EMS changes that led to improvements in environmental protection. However, Artistic was also interested in improved worker health and safety and reduced liability, which are not as easily quantified.

5.4 Objective 4 Successes and Challenges of EMS Implementation

- A key to EMS implementation at Artistic is the presence of a champion, the Health and Safety Manager, Ruben Angel, who is personally committed to successful EMS implementation at Artistic.
- Management has provided financial support to these efforts, which has been critical to successful EMS implementation.
- Maintaining focus to assure continual improvement is a challenge for a small and medium sized enterprise such as Artistic. Artistic has had difficulty balancing EMS work with other priorities such as human resources personnel actions and production demands. Artistic is now assigning more EMS responsibilities to other employees and reassigning some of the production and personnel related duties which the Health and Safety Manager had been given.
- Artistic is in the process of integrating its EMS into how the company conducts business. They expect the EMS activities to operate more smoothly, such as the

conducting of overall audits and the development of more complete operational controls, as the EMS is integrated into the daily operations of the business.

5.5 Objective 5 Evaluate the Value of Government Assistance to Small and Medium Sized Enterprises Attempting EMS Implementation

- A user-friendly and industry-specific EMS template that emphasizes compliance, pollution prevention, and stakeholder involvement can help small and medium-sized enterprises (SMEs) implement an EMS and thereby improve environmental protection.
- Anecdotal evidence suggests the interactive workshop series, which included contractor site visits between workshops to assist with implementation, was instrumental in helping the participants implement EMSs that are successfully helping them manage their environmental obligations.
- The support of an industry association is an important partnership in promoting EMSs to SMEs in an industry sector. The Metal Finishing Association of Southern California (MFASC) industry association was instrumental in building interest in EMS implementation, adding credibility to the workshop series and promoting it (e.g., through newsletters, special mailings, and association meetings) to potential participants.

6.0 Conclusions of the Artistic Plating Company Pilot Project

Artistic Plating Company's EMS experience demonstrates that improved environmental protection can result from EMS implementation. The EMS was instrumental in the identification of significant impacts, the setting of objectives to reduce those impacts, and establishing metrics for measuring performance improvements. Targets and objectives went over and above regulatory requirements in most cases. The EMS also led Artistic to increase monitoring schedules beyond the legally required timetables.

The design of an industry specific EMS template designed for small and medium sized enterprises, as well as a workshop series and contractor assistance to aid in its implementation, have been successful ingredients in helping Artistic Plating Company improve environmental protection.

The type of environmental information generated by Artistic's EMS is much greater than that required by law or regulation. Specifically, the identification of aspects and impacts, establishment of objectives and targets, and the tracking of environmental performance, is all useful environmental information that could benefit the public. However, sharing this information is voluntary. Artistic was willing to share information with stakeholders, and did so at the Working Group meetings. Also, this information is available to the public upon request.

Government sponsorship and support of the Metal Finishing EMS Template project provided two general benefits. First, the tools, mentoring and training associated with the

projects removed barriers for EMS implementation for small and medium sized enterprises. Secondly, government was able to address public policy objectives such as reducing certain pollutants and improving compliance in the metal finishing industry through the use of EMSs. Thirdly, government has a much better understanding of the effectiveness of an EMS in a metal finishing operation, and the factors which can impact an EMS in a small or medium sized business, such as high turnover, economic considerations, and regulatory changes.

ARTISTIC PLATING DATA TABLES

Table 1. Significant Aspects and Impacts for Artistic Plating[1]

Aspect	Regulated Impacts				Non-Regulated Impacts					
	Air	Water	Haz. Material or Waste	Health & Safety (other)	Air	Water	Solid Waste	Energy	Material/ Resource Input	Other
Chrome in wastewater treatment (WWT)		X								
Cyanide in WWT		X								
Nitric acid used & disposed	X									
Water usage						X	X		X	
WWT sludge – heavy metals		X	X							
Perchloroethylene	X									

[1] Data sources: University of North Carolina National Database Report, EMS Design Table 2: Activities, Aspects and Impacts; and Design Update Section 4.

Table 2. Objectives and Targets for Artistic Plating[2]

Objective	Target*	Status	Regulated		Non-Regulated
			Meets	Beyond	
Reduce chromium concentration at influent to Wastewater Treatment System (WWTS)	Decrease chromium concentration by 10%	Reduced 50%		X	
Decrease cyanide in wastewater to eliminate violations	50% lower than permitted, or 0.60 mg/L	Reduced 50%		X	
Reduce nitric acid use	95% reduction	No reduction. Substitution on trial.	X		
Reduce process water use	Meet permit requirement (20,000 gallons per day)	Variance granted (30,000 – 32,000 gallons per day)	X		
Eliminate perchloroethylene parts cleaning	100% elimination	Eliminated	X		
Prepare closure plan	Prepare closure plan	Revision Pending	X		
Conduct quarterly safety committee mtgs.	Conduct mtgs.	Conducted Bi-annually	X		
Update status of tiered permitting	Update status of tiered permitting	Presently Conditionally Authorized	X		
Prepare CalARP	Prepare CalARP	Pending notification from Anaheim Fire Dept.			X
Establish alternate contract with emergency services firm	Establish alternate contract with emergency services firm	Contract established			X
Track/record hazardous waste treated via daily, weekly, and monthly inspections	Track/record hazardous waste treated via daily, weekly, and monthly inspections	Tracking and recording in place	X		
Conduct daily surface tension measurements for chrome tanks	Conduct daily surface tension measurements for chrome tanks	Conducts daily		X	
Comply with confined spaces regulations	Comply with confined spaces regulations	Program in Place	X		
Measure and record duct velocities in scrubber	Measure and record duct velocities in scrubber	Measurements Taken	X		

[2] Data sources: University of North Carolina National Database Report, EMS Design Table 5: Planned Dates of Objectives and Targets; and Design Update Section 6.

* Targets are for June 2000 from a 1997 baseline.

Table 3. Pilot Project Environmental Performance Measure for Artistic Plating[3]

Indicator	Baseline Data						Update Data			
	1995		1996		1997		2000		2001 (Jan. – June)	
	Non-Normalized	Normalized	Non-Normalized	Normalized	Non-Normalized	Normalized	Non-Normalized	Normalized	Non-Normalized	Normalized
Wastewater	40,000 gallons per day (gpd)	607 gpd per employee	22,000 gpd	333 gpd per employee	18,000 gpd	273 gpd per employee	22,000 gpd	198 gpd per employee	29,128 gpd	277 gpd per employee
Copper to publicly owned treatment works (POTW)	0.8 mg/L	0.01 mg/L per employee	1.27 mg/L	0.02 mg/L per employee	1.65 mg/L	0.02 mg/L per employee	0.36 mg/L	0.00 mg/L per employee	0.75 mg/L	0.007 mg/L per employee
Sludge volume	33,694 lbs. per quarter	511 lbs. per employee	46, 523 lbs. per quarter	705 lbs. per employee	49,492 lbs. per quarter	750 lbs. per employee	22,496 lbs. per quarter	811 lbs. per employee	47,797 lbs. per quarter	455 lbs. per employee
Perchloroethylene (spent)	404 gallons per quarter	6.1 gallons per qtr./ employee	428 gallons per quarter	6.5 gallons per qtr./ employee	988 gallons per quarter	15.0 gallons per qtr./ employee	88.7 gallons per quarter	3.2 gallons per qtr./ employee	Eliminated	Eliminated
Buffing dust	3,520 lbs. per quarter	53 lbs. per quarter / employee	3,480 lbs. per quarter	52 lbs. per quarter / employee	3,040 lbs. per quarter	46 lbs. per quarter / employee	3,890 lbs. per quarter	35 lbs. per quarter/ employee	2,200 lbs. per quarter	42 lbs. per qtr / employee
Nitric acid (spent)	5,142 lbs. per quarter	78 lbs. per qtr / employee	Not available (N/A)	N/A	4,192 lbs per quarter	64 lbs. per qtr/ employee	5,628 lbs per quarter	51 lbs. per qtr/ employee	14,244 lbs per quarter.	68 lbs. per qtr / employee
Surface tension in chrome bath	N/A	N/A	N/A	N/A	N/A	N/A	33 dynes/cm squared	0.30 dynes/cm squared/employee	29 dynes/cm squared	0.28 dynes/cm squared per employee
Power								2,129,900 KWH	1,254.920 KWH	11,951.619 KWH per employee
Gas								63,125 Therms	27,917 Therms	266 Therms per employee

[3] Data sources: University of North Carolina National Database Report, Baseline Table 2: Environmental Performance Indicator Values; and Update Table 4: Environmental Performance Indicator Values.

Table 4. Environmental Performance Compared to Regulatory Requirements for Artistic Plating[4]

Regulatory Requirement			Objective and Target (if one identified for regulatory requirement)	Environmental Performance Measure				
Permitted Emission	Regulation	Permit limit		1995	1996	1997	2000	2001 (Jan.-June)
Chromium	Local air reqt.	NA*	Maintain compliance	N/A	N/A	0.10 lbs.	0	0
NOx	Local air reqt.	NA*	Maintain compliance	N/A	0	0.22 tons	0.20 tons/yr	0.32 tons/yr.
PM-10	Local air reqt.	NA*	Maintain compliance	N/A	0	0.01 tons/yr.	0.01 tons/yr	0.02 tons/yr
Sulfur oxide	Local air reqt.	NA*	Maintain compliance	N/A	0	0	0	0
Organic gases	Local air reqt.	NA*	Maintain compliance	N/A	0	.01 tons	0.01 tons/yr	0.02 tons/yr
Special organics	Local air reqt.	NA*	Maintain compliance	N/A	0	0	0	0
CO	Local air reqt.	NA*	Maintain compliance	N/A	0	0.06 tons	0.05 tons/yr	0.09 tons/yr
Toxic air contaminants	Local air reqt.	NA*	Maintain compliance	2.77 tons/yr.	2.91 tons/yr.	4.8 tons/yr.	2.37 tons/yr	1.85 tons/yr
Cyanide (totl.)	Local pretreatment prog. reqt.	1.2 mg/l	Exceed compliance	0.07 mg/l	1.35 mg/l	0.53 mg/l	0.38 mg/L	0.13 mg/L
Chromium (total)	Local pretreatment prog. reqt.	2.00 mg/l	Exceed compliance	0.77 mg/l	1.13 mg/l	0.85 mg/l	0.81 mg/L	0.37 mg/L
Copper	Local pretreatment prog. reqt.	3.00 mg/l	Maintain compliance	0.14 mg/l	0.57 mg/l	0.76 mg/l	1.01 mg/L	0.73 mg/L

[4] Data sources: University of North Carolina National Database Report, Baseline Table 4: Regulatory Requirements; Update Table 5: Change in Regulatory Requirements; EMS Design Table 5: Planned Dates of Objectives and Targets; and Design Update Section 6.

* No limits are provided because according to the SCAQMD (per conversations with Tom Liebel) absolute limits are not written into permits. For example NOx would have a ppm limit or there would be a limit on fuel consumption rather than an absolute limit on NOx emissions.

NOTE: 1998 and 1999 Environmental Performance Data for Table # 4 contains averaged data.

Nickel	Local pretreatment prog. reqt.	3.98 mg/l	Maintain compliance	1.55 mg/l	2.68 mg/l	1.50 mg/l	1.23 mg/L	0.51 mg/L
Zinc	Local pretreatment prog. reqt.	3.98 mg/l	Maintain compliance	omitted	0.19 mg/l	0.10 mg/l	0.39 mg/L	0.35 mg/L
Cadmium	Local pretreatment prog. reqt.	2.61 mg/l	Maintain compliance	Non-detectable	Non-detectable	Non-detectable	Non-detectable	Non-detectable
Gold	Local pretreatment prog. reqt.	0.43 mg/l	Maintain compliance	Non-detectable	Non-detectable	Non-detectable	Non-detectable	Non-detectable
Lead	Local pretreatment prog. reqt.	0.69 mg/l	Maintain compliance	Non-detectable	Non-detectable	Non-detectable	Non-detectable	Non-detectable

Table 5. Compliance Information for Artistic Plating[5]

Infraction	Historic	Baseline			Update	
		1995	1996	1997	2000	2001 (Jan.-June)
Major Violation			4 violations $2,089 total fines (lab testing fees)			3 violations – $545 fine (lab testing fee) for each violation
Significant (Moderate) Violation						
Minor Violation			3 violations - $244 fine	1 violation - $244 fine		
Non-Compliance			1 non-compliance			
Potential Non-Compliance						

Note: Most EPA enforcement policies explicitly utilize "Major, significant (moderate) and minor" classifications to determine the appropriate enforcement response to a given violation. A Non-compliance is an infraction either discovered by the regulated party or environmental agency that does not lead to violation. A Potential Non-compliance is a situation that is discovered and corrected before a violation could occur.

[5] Data Sources: University of North Carolina National Database Report, Baseline Report 3: Violation Report; Baseline Report 4: Non-compliance/Potential Non-Compliance Report; and Update Report 5: Violation Report; and Update Report 6: Non-compliance/Potential Non-Compliance Report.

Table 6. Environmental Information Type and Availability to Public[6]

Information Subject	Legal Reporting Requirement		Location of Public Information					
	Yes	No	Web site	Public Relations Dept.	Newsletter	Annual Report	Environmental Agency	Other
EMS Policy		X						Upon request
EMS Env. Aspects		X						Upon request
EMS Env. Impacts		X						Upon request
EMS Objectives and Targets		X						Upon request
Operation and Procedures		X						Upon request
Compliance information	X						X	Upon request
Hazardous waste generation	X						X	Upon request
Air emissions	X						X	Upon request
Water discharge	X						X	Upon request
Resource use: energy		X						Upon request
Resource use: water		X						Upon request
Resource use: materials		X						Upon request
Solid Waste		X						Upon request
TRI	X						X	Upon request
Community Right to Know	X						X	Upon request
Prop. 65	X						X	Upon request
Other (emission factors report, SB 14)	X						X	Upon request

Note: For Legal Reporting Requirement, mark NA if not applicable.

[6] Data Sources: California Supplemental Protocols

Table 7: Artistic Plating Economic Indicators: costs and savings; one time, per year, and projected over a 10 year period.

Item	Costs	Savings	10 year projection
Elimination of Perchloroethylene	$130,000 one time	$10,000 per year	- $30,000
Increased lab analysis for chromium	$2,000 per year		- $20,000
Increased lab analysis for cyanide	$4,500 per year		- $45,000
Increased lab analysis for copper	$2,000 per year		
Third stage tank	$10,000 one time		- $10,000
Reduce liquid chlorine usage in waste water treatment		$42,000 per year	+ $420,000
Reduction in other waste water treatment materials		$6,000 per year	+ $60,000
Reduction of plating rejects (nitric acid savings)		$94,000 per year	+ $940,000
Nitric acid costs: spent triacid and caustic soda	$78,000 per year	$39,000 per year	- $390,000
Decreased sludge volume		$18,896 per year	+ $188,960
Reduced sludge testing		$2,500 per year	+ $25,000
Total	$86,500 per year $140,000 one time	$203,396 per year or $116,896 per year net savings	+ $1,168,960 or $1,028,960 after deducting one time costs